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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/583,523

07/24/2007

Masum Choudhury

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MOLEX INCORPORATED
2222 WELLINGTON COURT
LISLE, IL 60532

EXAMINER

BEDTELYON, JOHN M

ART UNIT

PAPER NUMBER

2874

MAIL DATE

DELIVERY MODE

01/16/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/583,523

Applicant(s)

CHOUDHURY ET AL.

Examiner

John M. Bedtelyon

Art Unit

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 June 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

The listing of references in the Search Report is not considered to be an information disclosure statement (IDS) complying with 37 CFR 1.98. 37 CFR 1.98(a)(2) requires a legible copy of: (1) each foreign patent; (2) each publication or that portion which caused it to be listed; (3) for each cited pending U.S. application, the application specification including claims, and any drawing of the application, or that portion of the application which caused it to be listed including any claims directed to that portion, unless the cited pending U.S. application is stored in the Image File Wrapper (IFW) system; and (4) all other information, or that portion which caused it to be listed. In addition, each IDS must include a list of all patents, publications, applications, or other information submitted for consideration by the Office (see 37 CFR 1.98(a)(1) and (b)), and MPEP § 609.04(a), subsection I. states, "the list ... must be submitted on a separate paper." Therefore, the references cited in the Search Report have not been considered. Applicant is advised that the date of submission of any item of information or any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the IDS, including all "statement" requirements of 37 CFR 1.97(e). See MPEP § 609.05(a).

Drawings

1. The drawings are objected to because the lines and numbers are not uniformly thick and well-defined to permit adequate reproduction (see 37 CFR 1.84(l)). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office

action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3, 5, 6, 8-10, and 13-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Yegnanarayanan et al. (US Patent 6,580,863, hereinafter Yegnanarayanan).

With respect to claim 1, Yegnanarayanan teaches:

A waveguide optical mode transformer (see figures 5 and 8), comprising:

A core (30) formed on a planar substrate structure (10); and

A predetermined plurality of steps (70a-70c) formed into the top surface of the core so as to vertically taper the core, each step having a predetermined height and a predetermined length (see figures 5 and 8).

With respect to claims 2 and 3, Yegnanarayanan teaches wherein the core is horizontally tapered and wherein the vertical and horizontal tapers narrow at the same end of the core (see figures 5 and 8, especially figure 8(g)).

With respect to claim 5, Yegnanarayanan teaches the planar substrate structure (10) includes a dielectric layer (20) formed over a semiconductor substrate.

With respect to claim 6, Yegnanarayanan teaches the core layer (30) is crystalline silicon (column 5, lines 8-10 teaches the material of core layer (30)).

With respect to claim 8, Yegnanarayanan teaches an optical system, comprising:

A planar waveguide (column 11, lines 26-29); and

A tapered waveguide extension (30) (see figure 5 and figure 8) formed at the end of the planar waveguide for coupling light between the planar waveguide and an optical fiber (column 11, lines 26-29), the waveguide extension having a predetermined plurality of steps (70a-70c) formed into the top surface of the core so as to vertically taper the core, each step having a predetermined height and a predetermined length (see figures 5 and 8).

With respect to claim 9, Yegnanarayanan teaches wherein the tapered waveguide extension is horizontally tapered (see figures 5 and 8(g)).

With respect to claim 10, Yegnanarayanan teaches wherein the tapered waveguide extension includes a crystalline silicon core (column 5, lines 8-10 teaches the material of the core layer (30)).

With respect to claim 13, Yegnanarayanan teaches the optical fiber (column 11, lines 26-29).

With respect to claim 14, Yegnanarayanan teaches a method of manufacturing a tapered planar waveguide usable as an optical mode transformer between an optical fiber and a planar waveguide (see figures 5 and 8 and column 11, lines 26-29), comprising:

Providing a layer of core material (30) for the tapered waveguide; and

Forming a predetermined plurality of steps (70a-70c) into the top surface of the core so as to vertically taper the core layer (see figure 8(g)), each step having a predetermined height and a predetermined length (see figure 8(g)).

With respect to claim 15, Yegnanarayanan teaches forming a horizontal taper in the core layer (see figure 8(g)).

With respect to claim 16, Yegnanarayanan teaches providing a starting material comprising a substrate (10), a dielectric layer (20) formed on the substrate, and the layer of core material (30) formed on the dielectric layer (see figure 8).

With respect to claim 17, Yegnanarayanan teaches:

Defining the location of the wider end (70a) of the tapered waveguide on the core layer;

Applying a protective layer (81) over a predetermined area of the core layer extending from the defined wider end location (see figure 8a-g), the predetermined area defining the area one or more of the steps (see figure 8);

Etching the remaining unprotected area of the core layer to a predetermined depth define the height of a step (see figures 8a-8g and corresponding parts of the specification); and

Repeating the above steps a predetermined number of times, each time extending the predetermined area farther from the defined wide end location to define the length of a new step, whereby forming the predetermined plurality Of steps (70a, 70b and 70c) (see figure 8 and corresponding sections of the specification).

With respect to claim 18, Yegnanarayanan teaches the use of dry etching (column 5, lines 10-11).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 4, 7, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yegnanarayanan et al. (US Patent 6,580,863, hereinafter Yegnanarayanan) in view of Koch et al. (US Patent 4,944,838, hereinafter Koch).

With respect to claims 4, 7, 11 and 12, Yegnanarayanan teaches the limitations of claims 1, 8 and 10 as previously stated and teaches the dielectric layer (20) which would operate as a cladding layer for the core layer (30).

Yegnanarayanan is silent to a dielectric layer formed over the core, thereby having a dielectric layer formed both under and over the core, wherein each dielectric layer has a refractive index that is lower than the refractive index of the core.

Koch teaches a tapered semiconductor waveguide with a cladding layer above and below the core guiding area.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form another cladding layer over the core layer, as taught by the Koch reference, in the device as taught by Yegnanarayanan. Having the cladding layers above and below the core layer would allow the optical signal traversing the

tapered waveguide to undergo adiabatic beam expansion with increasing optical power coupling into the cladding region around the taper and therefor the spatial mode of the optical signal traversing the taper is forced to make an adiabatic transition from a tightly controlled mode such as output by a laser to a significantly larger mode which is excellent for fiber coupling, for example (see Koch column 5, lines 15-30).

Therefor, Koch teaches a cladding layer above and below the waveguide core. Yegnanarayanan teaches the use of a dielectric cladding layer below the core, so combining the teachings of Yegnanarayanan and Koch, one would be motivated to create another dielectric cladding layer above the core layer to have two functioning cladding layers. To function as cladding layers, the refractive indices of the dielectric layers would inherently be lower than the refractive index of the core, in order for the light to stay confined to the core via total internal reflection.

7. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yegnanarayanan et al. (US Patent 6,580,863, hereinafter Yegnanarayanan).

With respect to claims 19 and 20, Yegnanarayanan teaches the limitations of claim 14 as previously stated.

Yegnanarayanan is silent to the polishing of the wider end of the tapered waveguide or the applying an anti-reflective coating at the wider end of the tapered waveguide.

The act of polishing and applying anti-reflective coatings to optical fiber connection points is well known and useful for lowering the amount of unwanted back reflections, which reflect light back into the optical fiber at connection points.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to polish and apply an anti-reflective coating to the wider end of the tapered waveguide because in doing so, unwanted back reflections causing signal attenuation can be reduced, increasing efficiency of the device using a simple and low cost method.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M. Bedtelyon whose telephone number is 571-270-1290. The examiner can normally be reached on Monday - Friday, 10:00am - 6:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on 571-272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John Bedtelyon/
Patent Examiner, Art Unit 2874

/Kevin S. Wood/
Kevin S. Wood
Primary Examiner
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